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Whole-Body Diffusion Tensor Imaging: A Feasibility Study

Kenkel, David ; von Spiczak, Jochen ; Wurnig, Moritz C ; Filli, Lukas ; Steidle, Günter ; Wyss, Michael
; Boss, Andreas

Abstract: **OBJECTIVE** The aim of this study was to demonstrate the feasibility of whole-body diffusion tensor imaging (DTI) as a promising tool for research applications, for instance, for investigation of systemic muscle diseases. **MATERIALS AND METHODS** Twelve healthy volunteers (mean age, 26.6 years; range, 20-39 years) underwent whole-body magnetic resonance imaging at 3 T using an echo planar imaging sequence (b value, 400 s/mm) with 6 different spatial encoding directions. Coronal maps of DTI parameters including mean diffusivity, fractional anisotropy, and diffusion tensor eigenvalues (1-3) were generated using in-house MATLAB routines. Diffusion tensor imaging parameters were evaluated by region-of-interest analysis in skeletal muscle, cerebral gray and white matter, the kidneys, and the liver. **RESULTS** The acquisition time was 79 minutes 12 seconds. The different organs could be clearly depicted on the parametrical maps. Exemplary values in skeletal muscle were mean diffusivity, $1.67 \pm 0.16 \times 10^{-3}$ mm/s; fractional anisotropy, 0.26 ± 0.03 ; 1, $2.17 \pm 0.20 \times 10^{-3}$ mm/s; 2, $1.64 \pm 0.17 \times 10^{-3}$ mm/s; and 3, $1.22 \pm 0.12 \times 10^{-3}$ mm/s. **CONCLUSION** Whole-body DTI is technically feasible. Further refinements are required to achieve a higher signal-to-noise ratio and improved spatial resolution. A possible clinical application could be the assessment of systemic myopathies.

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